[0034] The key of the invention is to introduce an interoperability device in a communication system which integrates an IEEE 802.11 transceiver and a Bluetooth transceiver. The device prevents that one transceiver from transmitting while the other is receiving, which would cause interference at the receiving transceiver. In addition, the device prevents that both systems from transmitting at the same time to avoid interference at the receiving device(s), optionally the device prohibits simultaneous reception of both transceivers. In that way the radio receiver can be shared between the devices, allowing a cheaper and smaller hardware design. The invention also covers a dual band mode in which the IEE802.11 device and the Bluetooth device work in a different frequency band, and allows completely parallel operation of the two devices.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] The invention will now be described by way of example with reference to the accompanying Figures, in which:

[0036] **FIG. 1** illustrates a high-level architecture for implementing the present invention;

[0037] **FIG. 2** illustrates the architecture of **FIG. 1** adapted to utilise radio re-use in accordance with a preferred embodiment of the invention;

[0038] **FIG. 3** illustrates a Bluetooth HV-i packet;

[0039] **FIG. 4** illustrates the time-slot allocation for transmission of three different HV-i schemes;

[0040] **FIG. 5** illustrates a forward and reverse packet structure for IEEE 802.11; and

[0041] **FIG. 6** illustrates a possible single chip implementation of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0042] The invention serves to solve a fundamental problem associated with providing both a Bluetooth radio system and an IEEE 802.11 radio system in a single device. The fundamental problem that has been identified is that if either one of the radio systems is transmitting, there is need to prevent the other radio system from receiving or else the receiving system will be drowned out by the transmitting system. As will be further discussed hereinbelow, further problems associated with the dual operation of a IEEE 802.11 and Bluetooth radio system are overcome by preferred embodiments of the present invention as discussed hereinbelow.

[0043] Referring to **FIG. 1**, there is illustrated a high-level architecture of the combination of an IEEE 802.11 radio system transceiver and a Bluetooth radio system transceiver in a single system, in conjunction with an interoperability device in accordance with the present invention. It will be understood by one skilled in the art that only those elements necessary for the implementation of the present invention are shown in **FIG. 1**.

[0044] The dual mode transceiver of **FIG. 1** comprises: an IEEE 802.11 physical layer functional element **112**; an IEEE 802.11 MAC layer functional element **108**; a Bluetooth physical layer functional element **114**; a Bluetooth baseband control functional element **110**; and an interoperability device **106**, all of which comprise a combined IEEE 802.11/Bluetooth transceiver generally designated by reference numeral **100**. In addition an IEEE 802.11 driver **102** and a Bluetooth driver **104** are shown in **FIG. 1**.

[0045] The IEEE 802.11 driver **102** receives IEEE 802.11 packets from the dual mode transceiver **100** on lines **116**, and transmits IEEE 802.11 packets to the dual mode transceiver **100** on lines **116**. The Bluetooth driver **104** receives Bluetooth packets from the dual mode transceiver **100** on lines **118**, and transmits Bluetooth packets to the dual mode transceiver on lines **118**. The operation of the respective drivers **102** and **104** is exactly the same as their operation would be if the device were provided with a single IEEE 802.11 or Bluetooth transceiver respectively. However their function may be extended in the sense that they pass on switching signal from application(s) to the interoperability device **106**.

[0046] The IEEE 802.11 MAC functional element **108** and the IEEE 802.11 physical functional element **112** form the IEEE 802.11 transceiver of the dual mode transceiver. The IEEE 802.11 MAC functional element **108** operates in accordance with the IEEE standard arrangement to control access to the IEEE 802.11 transmission medium by the device to which it is connected. The IEEE 802.11 MAC functional element **108** receives and transmits IEEE 802.11 packets to and from the interoperability device **106** via lines **120**, and transmits and receives IEEE 802.11 packets to and from the IEEE 802.11 physical layer functional element **112** via lines **124**. The IEEE 802.11 physical layer functional element **112** operates in accordance with the IEEE standard arrangement to perform modulation etc. of the IEEE 802.11 packets and transmit/receive the packets via lines **128**, which interface the element to the device antenna.

[0047] The Bluetooth baseband control functional element **110** and the Bluetooth physical layer functional element **114** form the Bluetooth transceiver of the dual mode transceiver. The Bluetooth baseband control functional element **110** operates in accordance with the Bluetooth standard arrangement to control access to the transmission medium by the device to which it is connected. The Bluetooth baseband control functional element **110** receives and transmits Bluetooth packets to and from the interoperability device **106** via lines **122**, and transmits and receives Bluetooth packets to and from the Bluetooth physical layer functional element **114** via lines **126**. The IEEE 802.11 physical layer functional element **114** operates in accordance with the Bluetooth standard arrangement to perform modulation etc. of the Bluetooth packets and transmit/receive the packets via lines **130**, which interface the element to the device antenna.

[0048] The control of IEEE 802.11 packets and Bluetooth packets from the respective drivers **102** and **104** to the respective transceiver elements **108**/**112** and **110**/**114** is controlled in accordance with the invention by the interoperability device **106**. As shown in **FIG. 1**, the interoperability device is additionally connected to control circuitry within the device via control signal lines **132**.

[0049] The dual mode transceiver **100** operates in accordance with the invention in one of two modes. A first mode is a switching mode and a second mode is a multiplexing mode, both of which modes are discussed in further detail herein below.